

APPELLANT'S BRIEF UNDER 37 CFR §41.37		Docket No. C0012/7000
Applicant:	Raju C. Bopardikar, Jack J. Stiffler, Jacob Y. Bast, Gary A. Cardone, David E. Kaufman, Stuart P. MacEachern, Bruce D. McLeod, James M. Nolan, Jr., Zdenek Radouch and James A. Wentworth, III	
Serial No:	09/608,521	
Filed:	June 30, 2000	
For:	METHOD AND APPARATUS FOR IMPLEMENTING HIGH-PERFORMANCE, SCALEABLE DATA PROCESSING AND STORAGE SYSTEMS	
Examiner:	A. M. Mirza	
Art Unit:	2145	

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This brief is in furtherance of the Notice of Appeal, filed in this case on February 15, 2011.

The fees required under §41.20(b)(2), and any required petition for extension of time for filing this brief and fees therefor, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

A single copy of this brief is transmitted (37 C.F.R. §41.37(a)) and contains these items under the following headings, and in the order set forth below (37 C.F.R. §41.37(c)(1)):

- I REAL PARTY IN INTEREST
- II RELATED APPEALS AND INTERFERENCES
- III STATUS OF CLAIMS
- IV STATUS OF AMENDMENTS
- V SUMMARY OF CLAIMED SUBJECT MATTER
- VI GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL
- VII ARGUMENT
- VIII APPENDIX OF CLAIMS INVOLVED IN THE APPEAL
- IX EVIDENCE APPENDIX
- X RELATED PROCEEDINGS APPENDIX

I REAL PARTY IN INTEREST (37 C.F.R. §41.37(c)(1)(i))

The real party in interest in this appeal is EMC Corporation, 176 South Street, Hopkinton, MA 01748.

II RELATED APPEALS AND INTERFERENCES (37 C.F.R. §41.37(c)(1)(ii))

A notice of appeal has been filed in U.S. application no. 11/384,779. As the claims of this application have been rejected over the claims of U.S. application no. 11/384,779 on the basis of nonstatutory obviousness-type double patenting, the appeal of the latter application may directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III STATUS OF CLAIMS (37 C.F.R. §41.37(c)(1)(iii))

A. TOTAL NUMBER OF CLAIMS IN APPLICATION

The claims in the application are: 1-86.

B. STATUS OF ALL THE CLAIMS IN APPLICATION

1. Claims pending: 1, 3-11, 44 and 46-54.
2. Claims canceled: 2 and 45.
3. Claims withdrawn from consideration, but not canceled: 12-43 and 55-86.
4. Claims allowed: None.
5. Claims rejected: 1, 3-11, 44 and 46-54.
6. Claims objected to 7-8 and 50-51.

C. CLAIMS ON APPEAL

The claims on appeal are: 1, 3-11, 44 and 46-54.

IV STATUS OF AMENDMENTS (37 C.F.R. §41.37(c)(1)(iv))

No amendments have been filed.

V SUMMARY OF CLAIMED SUBJECT MATTER (37 C.F.R. §41.37(c)(1)(v))

The present invention relates to a method and apparatus for providing storage services to clients from a "pool" of storage devices (see page 4, line 21 - page 5, line 13 and Figure 1). The clients (102, 104) are connected to access interfaces (106, 108,

122) which are, in turn, connected to the pool of storage devices (118, 120, 122, 124) by a switch fabric (114, 116). The access interfaces communicate with the devices in the storage device pool and, based on the workload of each device in the storage device pool, select a subset of the storage devices to use for any given transaction and distribute the workload (page 5, lines 16-22). Thus, the data received from a client is transferred to the selected subset of storage devices based on the workload of the devices rather than on a physical device address (page 5, line 23 – page 6, line 6). The result of this operation is that data may be stored in a storage device other than the storage device from which that data was retrieved (page 7, line 22 – page 8, line 11).

The independent claims correspond to the specification as follows:

Claim 1 - an access interface module (page 5, lines 9-14)

which receives from the client data storage requests, each including a data object to be stored and a data object identifier that identifies that data object (page 10, lines 11-25) and,

in response to each storage request and based on a workload and on relative demands placed on subsets of the plurality of storage devices instead of a physical location in the plurality of devices, dynamically selects a subset of the plurality of storage devices in which the data is stored (page 5, lines 16-22 and page 14, lines 12-18, page 18, lines 12-24)

so that data corresponding to the same data object identifier can be transferred to different physical storage device locations from request to request in order to dynamically distribute the workload across the plurality of storage devices (page 14, line 19-page 15, line 2); and

a switch fabric, for temporarily connecting the access interface module to the selected subset of the plurality of storage devices so that the

data can be transferred to the selected subset of storage devices
(page 4, line 25 – page 5, line 8).

Claim 44

- step (a) - page 10, lines 11-25
- step (b) - page 5, lines 16-22 and page 14, lines 12-18; page 14, line 19-
page 15, line 2
- step (c) - page 4, line 25 – page 5, line 8

The dependent claims correspond to the specification as follows:

Claim 3 – page 4, line 25 – page 5, line 1, Figure 9, 952 and 942.

Claim 4 - page 5, lines 1-8.

Claim 5 – page 10, lines 4-10 Figure 3, 302, 304.

Claim 6 – page 22, lines 21-28, Figure 9, 952 and 942.

Claim 7 – page 12, lines 11-15 Figure 2 218, 220, 222, 224).

Claim 8 – page 12, lines 15-17 , Figure 2, 206, 216, 218.

Claim 9 – page 12, lines 17-18.

Claim 10 – page 9, lines 14-18, Figure 3, 322.

Claim 11 – page 4, lines 23-24, Figure 1 106, 108, 110, 112.

Claim 46 – page 4, line 25 – page 5, line 1, Figure 9, 952 and 942.

Claim 47 - page 5, lines 1-8.

Claim 48 – page 10, lines 4-10 Figure 3, 302, 304.

Claim 49 – page 22, lines 21-28, Figure 9, 952 and 942.

Claim 50 – page 12, lines 11-15 Figure 2 218, 220, 222, 224).

Claim 51 – page 12, lines 15-17 , Figure 2, 206, 216, 218.

Claim 52 – page 12, lines 17-18.

Claim 53 – page 9, lines 14-18, Figure 3, 322.

Claim 54 – page 4, lines 23-24, Figure 1 106, 108, 110, 112.

VI GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL (37 C.F.R. 41.37 (c)(1)(vi))

- A. Whether claims 1, 3-11, 44 and 46-54 have been properly rejected on the ground of nonstatutory obviousness-type double patenting over claims 1-48 of U.S. Application No. 11/384,779.
- B. Whether claims 7-8 and 50-51 have been properly objected to.
- C. Whether claims 1, 3-6, 9-11, 44, 46-49 and 52-54 are patentable under 35 U.S.C. 103(a) over U.S. Patent No. 6,195,703 (Blumenau) in view of U.S. Patent No. 5,909,686 (Muller.)

VII ARGUMENT (37 C.F.R. §41.37(c)(1)(vii))

A. Claims 1,3-11,44 and 46-54 have not been properly rejected on the ground of nonstatutory obviousness-type double patenting over claims 1-48 of U.S. application no. 11/384,779.

1. 35 U.S.C. §121 bars the use of U.S. application no. 11/384,779 as a reference against this application.

U.S. application no. 11/384,779 is a divisional of this application (application no. 09/608,521) filed as a result of a restriction requirement under 35 U.S.C. §121 dated February 23, 2006. That restriction requirement requested restriction to one of the following inventions:

- I. Claims 1-11, 44-54, drawn to Resource Allocation, classified in class 718, subclass 104.
- II. Claims 12-35, 55-78, drawn to Storage Sharing, classified in class 709, subclass 214.
- III. Claims 36-43, 79-86, drawn to Context Switching, classified in class 718, subclass 108.

Original group II claims 12-35 and 55-78 of this application became claims 1-48 of U.S. application no. 11/384,779.

35 U.S.C. §121 states in part that:

“ A patent issuing on an application with respect to which a requirement for restriction under this section has been made , or on an application filed as a result of such a requirement, shall not be used as a reference either in the Patent and Trademark Office or in the courts against a divisional application ...”

Therefore, on its face, 35 U.S.C. §121 forbids the use of the parent application as a reference in the divisional application. However, the Patent and Trademark Office has recognized some exceptions. MPEP §804.01 states that the prohibition of double patenting rejections under 35 U.S.C. §121 does not apply where:

“(B) The claims of the different applications or patents are not consonant with the restriction requirement made by the examiner, since

the claims have been changed in material aspects from the claims at the time that the restriction requirement was made. “

The claims in both this application and U.S. application no. 11/384,779 have been amended. However, applicants believe that the original line of demarcation has been preserved.

For example, original claims 1 and 12 of this application are representative of the original line of demarcation. These claims are set forth below:

Original claim 1

Apparatus for providing high-performance, scaleable data processing and storage services to a client from a plurality of resources, comprising

an access interface module which receives requests for service from the client and selects a subset of the plurality of resources to provide the requested service and distribute the workload across the plurality of resources; and

a switch fabric for temporarily connecting the access interface module to the selected subset of the plurality of resources for providing the service to the client.

Original claim 12

A disk-based storage system for providing high-performance, scaleable storage services to a client from a plurality of disks, comprising

a disk interface module connected to the plurality of disks for controlling data stored on the plurality of disks;

a host interface module which receives requests for storage service from the client and selects a subset of the plurality of disks to provide the requested storage and distribute the workload across the plurality of disks; and

a switch fabric for temporarily connecting the host interface module to the resource [*sic* should be “disk interface”] module for providing the storage service to the client.

A comparison of these claims shows that claim 1 recites a “plurality of resources” whereas claim 12 recites a “disk interface module” and a “plurality of disks” connected

to the disk interface module. The restriction requirement stated that the inventions of groups I, II and III were sub-combinations disclosed as usable together, but that they were distinct because they were separately usable. In particular, the restriction requirement stated that the invention claimed in group I was useable for resource allocation and lacked the features of the claims in group II; that is, the term “resources”, as recited in the group I claims, covers resources other than the disks recited in the group II claims.

Corresponding pending claims from both this application and U.S. application no. 11/384,779 are set forth below:

Claim 1 of this application

Apparatus for providing high-performance, scaleable data storage services to a client from a plurality of storage devices, comprising:

an access interface module which receives from the client data storage requests, each including a data object to be stored and a data object identifier that identifies that data object and, in response to each storage request and based on a workload and on relative demands placed on subsets of the plurality of storage devices instead of a physical location in the plurality of storage devices, dynamically selects a subset of the plurality of storage devices in which the data is stored so that data corresponding to the same data object identifier can be transferred to different physical storage

Claim 1 of U.S. application no. 11/384,779

A disk-based storage system for providing high-performance, scaleable storage services to a client from a plurality of disks, comprising:

a disk interface module connected to the plurality of disks for controlling data stored on the plurality of disks;

a host interface module which receives requests for storage service from the client, each storage service request including a data object to be stored and a data object identifier that identifies that data object and, in response to each storage service request and based on a workload and on relative demands placed on subsets of the plurality of disks instead of a physical location in the plurality of disks, selects a subset of the plurality of disks to provide the requested storage so

device locations from request to request in order to dynamically distribute the workload across the plurality of storage devices; and

a switch fabric for temporarily connecting the access interface module to the selected subset of the plurality of storage devices so that the data can be transferred to the selected subset of storage devices.

that data corresponding to the same data object identifier can be transferred to different physical disk locations from request to request in order to distribute the workload across the plurality of disks; and

a switch fabric for temporarily connecting the host interface module to the resource module for providing the storage service to the client.

A comparison of these claims shows that claim 1 of this application recites a "plurality of storage devices" whereas claim 1 of U.S. application no. 11/384,779 recites a "disk interface module" and a "plurality of disks" connected to the disk interface module. As with original claims 1 and 12 of this application, these claims cover sub-combinations that are disclosed as usable together. Applicants content that these claims cover distinct inventions because they are separately usable for the same reason that original claims 1 and 12 were considered separately usable. In particular, the term "storage devices", as recited in claim 1 of this application, covers devices, such as flash drives, smart cards and re-writable CDs, other than the disks recited in claim 1 of U.S. application no. 11/384,779.

Since the original line of demarcation has been preserved, 35 U.S.C. §121 bars the use of U.S. application no. 11/384,779 as a reference in a rejection of this application. Therefore, the rejection is improper.

2. The rejection is improper because there is no indication that the rejection was approved by the Technology Center Director as required by MPEP §804.04.

MPEP §804.04 states:

"In order to promote uniform practice, every Office action containing a rejection on the ground of double patenting which relies on the parent application rejecting the claims in a divisional or continuing application where the divisional or continuing application was filed because of a requirement to restrict made by the examiner under 35 U.S.C. 121, including a requirement to elect species, must be submitted to the Technology Center Director for approval prior to mailing. If the rejection on the ground of double patenting is disapproved, it shall not be mailed but other appropriate action shall be taken. Note MPEP §1003."

Although MPEP §804.04 relates to a rejection in a divisional application which relies on the parent application, applicants believe that it equally applies to a situation where a parent application is being rejected under a rejection that relies on the divisional application. Although the last office action dated November 15, 2010 was approved by a supervisory patent examiner, there is no indication that the double patenting rejection was reviewed, or approved, by the responsible Technology Center Director. Therefore, the rejection does not follow patent office practice and is improper.

3. The rejection is improper because U.S. application no. 11/384,779 has not been allowed and the rejection should have been a **provisional** rejection, which should be dismissed when this application is otherwise allowable.

MPEP §804.I.B states "

"Occasionally, the examiner becomes aware of two copending applications that were filed by the same inventive entity, or by different inventive entities having a common inventor, and/or by a common assignee, or that claim an invention resulting from activities undertaken within the scope of a joint research agreement as defined in 35 U.S.C. 103(c)(2) and (3), that would raise an issue of double patenting if one of the applications became a patent. Where this issue can be addressed without violating the confidential status of applications (35 U.S.C. 122), the courts have sanctioned the practice of making applicant aware of the potential double patenting problem if one of the applications became a patent by permitting the examiner to make a "provisional" rejection on the ground of double patenting..."

The present rejection corresponds directly to the situation described in the above paragraph. MPEP §804.I.B.1 indicates how to handle this type of rejection:

"If a 'provisional' nonstatutory obviousness-type double patenting (ODP) rejection is the only rejection remaining in the earlier filed of the two pending applications, while the later-filed application is rejectable on other grounds, the examiner should withdraw that rejection and permit the earlier-filed application to issue as a patent without a terminal disclaimer.

This application was filed on June 30, 2000 more than five years before the filing date of U.S. application no. 11/384,779 (March 20, 2006). This application is also the subject of a Petition to Make Special (Accelerated Examination) Under MPEP §708.02 VIII which was granted on April 30, 2010. Therefore, a decision on appeal should be made well before the decision in U.S. application no. 11/384,779. The claims in U.S. application no. 11/384,779 have been rejected on grounds other than nonstatutory obviousness-type double patenting. Consequently, applicants request, that if the Board of Patent Appeals finds this application allowable over all other objections and rejections, that it dismiss this rejection and advance this application to issue as set forth by MPEP §804.I.B.1.

B. Claims 7-8 and 50-51 have not been properly objected to.

Applicants cannot respond directly to this objection because no reasons for the objection have been stated. However, applicants see no reasons for objecting to these claims other than those stated for the other rejected claims. Therefore, the responses applied to the other claims are incorporated herein as a response to this objection.

C. Prima facie obviousness has not been established because the combination of Blumenau and Muller does not teach or suggest the structure recited in claims 1, 3-6, 9-11, 44, 46-49 and 52-54.

Obviousness is a legal conclusion based on factual evidence. Graham v. John Deere Co. 383 US 1, 148 USPQ 459 (1966). To establish the *prima facie* obviousness

Appellant's Brief 11 of 23

of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. In re Wada and Murphy, Appeal 2007-3733, citing In re Ochiai, 71 F.3d 1565, 1572 (Fed. Cir. 1995) and In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1970).

The examiner refers to column 12, lines 26-33 and column 2, lines 5-21 of the Blumenau reference. There, the reference discloses a storage system in which a host can send a request to access storage resources through a switch to one of a plurality of network ports of a data storage subsystem. The switch allows paths to be selected between a particular host and alternative storage subsystem ports based on load balancing considerations. However, once a request arrives at any network port of the storage subsystem a data address in the request is translated to a physical location on one of the storage devices and the data passes through the port and is written to, or read from, that storage device. For example, Blumenau, column 4, lines 43-53, discloses:

"If the data to be accessed resides in the cache memory, then the port adapter accesses the data in the cache memory. If the data to be accessed does not reside in the cache memory, then the port adapter forwards a storage access request to the storage adapters 37, 38. One of the storage adapters 37, 38 responds to the storage access request by performing a logical-to-physical translation to determine where the data to be accessed resides on the storage devices, and reads the data from the storage devices and writes the data to the cache memory, for access by the port adapter." (emphasis added)

This section indicates that the physical storage location depends on the data address and is not "in order to dynamically distribute the workload across the plurality of storage devices". Further sections of Blumenau reinforce this section. For example, the examiner contends that column 12, lines 26-33 of Blumenau discloses "a data storage request" that includes "a data identifier." However, this section of Blumenau discusses the contents of entries in a routing table that controls the switch. As stated there, each entry includes a list pointer for the host, a storage port list for the host, a host name, a world-wide name for the host, and a source address (S_ID) for the host. All of this

information refers to the host, not to data (see, for example Blumenau, column 12, lines 9-10).

Consequently, although data access requests can be routed along different paths between a host and the data storage subsystem, there is no teaching or suggestion in Blumenau that the data, to which the requests refer, "can be transferred to different physical storage device locations from request to request in order to dynamically distribute the workload across the plurality of storage devices". Instead, data is statically assigned to specific storage devices. Therefore, the advantages achieved by the invention, such as "dynamically distribute[e] the workload across the plurality of storage devices" and "data corresponding to the same data object identifier can be transferred to different physical storage device locations", are not achieved by the Blumenau system.

The Muller reference discloses a store and forward data packet switch in which data packets received at input ports are temporarily stored and then selectively forwarded to switch output ports based on information in a forwarding database. The bulk of the Muller disclosure is directed to hardware that allows a CPU to efficiently manage the information in the forwarding database as the switch operates. However, since neither of the cited references discloses a system in which "data corresponding to the same data identifier "can be transferred to different physical storage device locations from request to request in order to dynamically distribute the workload across the plurality of storage devices the combination of these references cannot teach or suggest this type of operation.

The examiner contends "One [of] ordinary skill in the art at the time of the invention knows that 'routing information based on the loading characteristic of the storage access request received at the switch inputs in order to balance loading of the storage access requests upon the outputs of the switch' is prime example of load balancing, where the routing information is based on the loading characteristic of the meaning workload of the memory." However, this is not what is being claimed. The claims recite the feature that "data corresponding to the same data object identifier can

be transferred to different physical storage device locations from request to request” and do not discuss, as asserted by the Examiner, how data arrives there. For example, claim 1 (and claim 44 which has similar claim features) recites:

“...an access interface module which receives from the client data storage requests, each including a data object to be stored and a data object identifier that identifies that data object and, in response to each service request and based on a workload and on relative demands placed on subsets of the plurality of storage devices instead of a physical location in the plurality of storage devices, dynamically selects a subset of the plurality of storage devices in which the data is stored so that data corresponding to the same data object identifier can be transferred to different physical storage device locations from request to request in order to dynamically distribute the workload across the plurality of storage devices.”

This claim wording does not read onto the Blumenau/Muller combination. Even if the entire Blumenau storage subsystem is considered to be a storage “device” because, which Applicants do not concede, under this interpretation, it would not be possible to “, dynamically selects a subset of the plurality of storage devices.” While the Blumenau/Muller system may alleviate overloading of the data storage subsystem network ports, such a combination would not accomplish and do not disclose the aforementioned recited claim features. Accordingly, Blumenau and Muller do not teach that “data corresponding to the same data object identifier can be transferred to different physical storage device locations from request to request” as recited in claims 1 and 44. Accordingly, claims 1 and 44 patentably distinguish over the cited reference combination.

Claims 3-6, 9-11, 46-49 and 52-54 are dependent, either directly or indirectly, on claims 1 and 44, respectively, and incorporate the limitations thereof. Therefore, they also distinguish over the cited reference combination in the same manner as claims 1 and 44. In addition, these claims recite further elements not disclosed or suggested by the cited reference combination.

Claims 3-6 and 46-49 recite additional features. Claims 3 and 46 cite the features that “wherein the switch fabric comprises a control switch fabric for transferring
Appellant’s Brief 14 of 23

control information and a separate data switch fabric for transferring data” Claims 4 and 47 recite the features that “the control switch fabric is optimized for transferring control information and the data switch fabric is optimized for transferring data.” Claims 5 and 48 recited the features that “the request for storage includes control information and data and wherein the access interface module separates the control information and the data and transfers the data to the selected subset of storage devices over the data switch fabric.” Claims 6 and 49 recite the features of “the data switch fabric comprises a non-blocking crossbar switch for data transfer and the control switch fabric comprises an Ethernet switch for control information transfer.”

While the Blumenau switch may switch both data requests and the data to which they refer, the switch itself is only shown as a single block (40) with no indication that two separate switches are used. The examiner refers to Blumenau, column 2, lines 7-19. However, this section of Blumenau discusses how the switch computer routes data and requests between switch inputs and switch outputs; no internal switch details are provided. Therefore, the elements recited in claims 3 and 46, “a control switch ... and a separate data switch fabric ” are not disclosed in Blumenau. Muller also discloses no switch analogous to the recitation of these claims.

Claims 4 and 47 recite that “the control switch fabric is optimized for transferring control information and the data switch fabric is optimized for transferring data”. The examiner cites Blumenau column 2, lines 29-41 as disclosing this limitation. However, as described above, this section of Blumenau discloses details of the computer that controls the switch and does not disclose details of the switch itself.

Claims 5 and 48 recite that “the access interface module separates the control information and the data”. The examiner cites Blumenau column 6, lines 44-53, as disclosing this limitation. This section of Blumenau discloses a mechanism that adjusts the number of loop ports assigned to a host to achieve load balancing. However, the disclosed mechanism relates only to the data packets and does not disclose that control information is separated from the data as recited.

Claims 6 and 49 recite that the “data switch fabric comprises a non-blocking crossbar switch for data transfer and the control switch fabric comprises an Ethernet switch for control information transfer.” The examiner refers to Muller column 4, lines 1-23. At this section, Muller discloses details of subsystems which are used to construct a network switch. As disclosed, each subsystem includes a switch and a forwarding database. The switch is disclosed as being able to handle many formats, such as Gigabit Ethernet and Fast Ethernet. However, Muller does not disclose that the switch fabric has both a non-blocking crossbar data switch and an Ethernet control switch as claimed.

Claims 9 and 52 recite that an “access interface module selects a subset of the plurality of storage devices based on the preallocation information.” As mentioned previously, the Blumenau and Muller references store data in storage devices at locations that are determined by addresses, not preallocation information. Therefore, these claims also distinguish over the cited reference combination.

Respectfully submitted

_____/paul e. kudirka/_____
Paul E. Kudirka, Esq. Reg. No. 26,931
LAW OFFICES OF PAUL E. KUDIRKA
Customer Number 64967
Tel: (617) 357-0010 Fax: (617) 357-0035

VIII APPENDIX OF CLAIMS (37 C.F.R. §41.37(c)(1)(viii))

The text of the claims involved in the appeal is:

1. Apparatus for providing high-performance, scaleable data storage services to a client from a plurality of storage devices, comprising:
 - an access interface module which receives from the client data storage requests, each including a data object to be stored and a data object identifier that identifies that data object and, in response to each storage request and based on a workload and on relative demands placed on subsets of the plurality of storage devices instead of a physical location in the plurality of storage devices, dynamically selects a subset of the plurality of storage devices in which the data is stored so that data corresponding to the same data object identifier can be transferred to different physical storage device locations from request to request in order to dynamically distribute the workload across the plurality of storage devices; and
 - a switch fabric for temporarily connecting the access interface module to the selected subset of the plurality of storage devices so that the data can be transferred to the selected subset of storage devices.
3. The apparatus of claim 1 wherein the switch fabric comprises a control switch fabric for transferring control information and a separate data switch fabric for transferring data.

- 1 4. The apparatus of claim 3 wherein the control switch fabric is optimized for
2 transferring control information and the data switch fabric is optimized for
3 transferring data.
- 1 5. The apparatus of claim 3 wherein the request for storage includes control
2 information and data and wherein the access interface module separates the
3 control information and the data and transfers the data to the selected subset of
4 storage devices over the data switch fabric.
- 1 6. The apparatus of claim 3 wherein the data switch fabric comprises a non-
2 blocking crossbar switch for data transfer and the control switch fabric comprises
3 an Ethernet switch for control information transfer.
- 1 7. The apparatus of claim 1 further comprising a resource module connected to the
2 plurality of storage devices for generating preallocation information that
3 preallocates storage from the plurality of storage devices in order to evenly
4 distribute a workload across the plurality of storage devices.
- 1 8. The apparatus of claim 7 wherein the switch fabric connects the access interface
2 module to the resource module so that the resource module can transfer the
3 preallocation information to the access interface module.
- 1 9. The apparatus of claim 8 wherein the access interface module selects a subset
2 of the plurality of storage devices based on the preallocation information.

1 10. The apparatus of claim 1 wherein the access interface module comprises a data
2 memory which temporarily stores information transferred between the access
3 interface module and the selected subset of the plurality of storage devices.

1 11. The apparatus of claim 1 further comprising a plurality of access interface
2 modules each access interface module receiving storage requests from a
3 plurality of clients.

1 44. A method for providing high-performance, scalable data storage services to a
2 client from a plurality of storage devices, the method comprising:

- 3 (a) providing an access interface module which receives from the client data
4 storage requests, each including a data object to be stored and a data
5 object identifier that identifies that data object;
- 6 (b) using the access interface module in response to each data storage
7 request and based on a workload and on relative demands placed on
8 subsets of the plurality of storage devices instead of a physical location in
9 the plurality of storage devices, dynamically selects a subset of the
10 plurality of storage devices in which the data is stored so that data
11 corresponding to the same data object identifier can be transferred to
12 different physical storage device locations from request to request in order
13 to dynamically distribute the workload across the plurality of storage
14 devices; and

15 (c) using a switch fabric to temporarily connect the access interface module to
16 the selected subset of the plurality of storage devices so that the data can
17 be transferred to the selected subset of storage devices.

1 46. The method of claim 44 wherein step (c) comprises:

2 (c1) using a control switch fabric for transferring control information; and

3 (c2) using a separate data switch fabric for transferring data.

1 47. The method of claim 46 wherein step (c1) comprises optimizing the control

2 switch fabric for transferring control information and step (c2) comprises

3 optimizing the data switch fabric for transferring data.

1 48. The method of claim 46 wherein the request for storage includes control

2 information and data and wherein step (b) comprises separating the control

3 information and the data and step (c) comprises transferring the data to the

4 selected subset of storage devices over the data switch fabric.

1 49. The method of claim 46 wherein step (c1) comprises using a non-blocking

2 crossbar switch for data transfer and step (c2) comprises using an Ethernet

3 switch for control information transfer.

1 50. The method of claim 44 further comprising:

2 (d) providing a resource module connected to the plurality of storage devices;

3 and

4 (e) using the resource module to generate preallocation information that
5 preallocates storage from the plurality of storage devices in order to
6 evenly distribute a workload across the plurality of storage devices.

1 51. The method of claim 50 wherein step (c) comprises connecting the access
2 interface module to the resource module so that the resource module can
3 transfer the preallocation information to the access interface module.

1 52. The method of claim 51 wherein step (b) comprises selecting a subset of the
2 plurality of storage devices based on the preallocation information.

1 53. The method of claim 44 wherein step (b) comprises temporarily storing
2 information transferred between the access interface module and the selected
3 subset of the plurality of storage devices.

1 54. The method of claim 44 wherein step (a) further comprises providing a plurality of
2 access interface modules each access interface module receiving storage
3 requests from a plurality of clients.

IX EVIDENCE APPENDIX (37 C.F.R. §41.37(c)(1)(ix))

None

X RELATED PROCEEDINGS APPENDIX (37 C.F.R. §41.37(c)(1)(x))

No decisions have been rendered as an appeal brief has not yet been filed.